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*Office of Technical Assistance*  
**Executive Office of Environmental Affairs**  
**Commonwealth of Massachusetts**

# Toxics Use Reduction Case Study

## 1,1,1-TRICHLOROETHANE ELIMINATION AT **SMITH AND WESSON**

### **SUMMARY**

Smith and Wesson implemented process changes to reduce the use of 1,1,1-Trichloroethane (TCA) in its cold degreasing operations. The installation of agitating parts washers and drum top washers, which use an aqueous solution has eliminated the use of TCA and saves the firm at least \$6,870 annually.

### **BACKGROUND**

Smith and Wesson is a 1,400-worker manufacturer of handguns located in a 600,000 square foot facility in Springfield, Massachusetts. As a routine step in parts inspection, a set number of parts were separated from the manufacturing lot and cleaned in TCA. TCA was also used by workers for quick cleanup of parts. A gasoline station pumping system was used for distribution of TCA from the maintenance department. The use of TCA resulted in fugitive emissions totaling 96,920 lbs in 1986.

### **TOXICS USE REDUCTION PLANNING**

TCA is a volatile organic compound (VOC). TCA vapors released indoors are a health risk to workers. TCA released to the environment is a significant contributor to air pollution. The rising cost of purchasing TCA adds to cleaning costs. Finally, Clean Air Act regulations already sharply restrict the use of TCA and will ultimately completely ban its production and consumption.

With these factors in mind, the Smith and Wesson Environmental Manager, the Purchasing Manager, and the Pollution Control Handler, with input from operations personnel, launched a search for an alternative to TCA. The team contacted 30 vendors of aqueous cleaners and obtained samples for testing. These samples were evaluated by equipment operators in five key production areas. Criteria for evaluation included amount and type of oil on parts, compatibility with the parts substrate, and compatibility with the wastestreams containing water soluble coolant and the discharge from other aqueous washing stations. (These streams are combined and sent through an ultrafilter to reduce water discharge volume.)

### **TOXICS USE REDUCTION MODIFICATIONS**

Smith and Wesson had good results with the first aqueous cleaner used to replace TCA. This cleaner was chosen on the basis of recommendations from the equipment operators. The cleaning solution is used in drum top washers or agitating parts washers. Installation required about one hour

at each station and required no changes in operation or additional worker training. However, the use of this solvent still posed some concerns to the team; the raw product contained dichloroethylamine, which is a listed toxic chemical under SARA 313. Working with another vendor and the equipment operators, the team found and introduced another replacement which is non-hazardous and contains no chemicals listed under TURA.

## RESULTS

**Reductions Achieved:** The new cleaning operation reduced TCA emissions at the Smith and Wesson facility by over 76,000 lbs during a six year span. Based on a request from the company vice president to eliminate TCA, Smith and Wesson's Environmental Manager, Bill Serra, was able to end Smith and Wesson's use of TCA in November 1992.

**Economics:** The cost for plantwide substitution was \$20,000. Smith and Wesson has realized annual savings of \$6,878 through replacement of TCA in cold degreasing with an aqueous cleaner. According to Smith and Wesson's extensive capital budgeting process, the projects had a 2.0 year payback period. Savings are due to eliminated virgin chemical costs and lab fees assessed by the TCA recycler.

**Benefits:** With the November 1992 elimination of TCA from its manufacturing processes, Smith and Wesson has created a safer work environment. Workers no longer breathe the vapors of evaporating TCA, and no longer experience the whitening of hands caused by the solvent's defatting effect. Some workers have told Serra that the new aqueous cleaner is more effective than TCA. The new cleaning equipment allows workers to process more parts. Under the incentive pay system at Smith and Wesson, more parts means greater earning potential.

*This Case Study is one of a series of such documents prepared by the Office of Technical Assistance for Toxics Use Reduction (OTA), a branch of the Massachusetts Executive Office of Environmental Affairs, whose mission is to assist industry in reducing the use of toxic substances and/or the generation of toxic manufacturing byproducts. OTA's confidential, nonregulatory services are available at no charge to Massachusetts businesses and institutions that use toxic chemicals. For further information about this or other case studies or about OTA's technical services, contact: Office of Technical Assistance, Executive Office of Environmental Affairs, 100 Cambridge Street, Room 2109, Boston, MA 02202, 617-727-3260, (fax) 617-727-3827.*